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PATENT ABSTRACTS OF JAPAN

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YONEYAMA TERU

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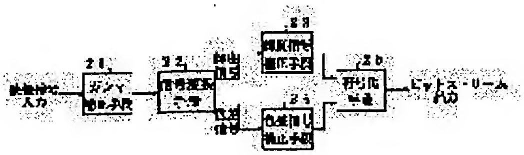
(54) VIDEO SIGNAL ENCODING DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a video signal encoding device for suppressing the change of image quality in the case of displaying a video signal, which is prepared, while using a 1st display device, on a 2nd display device.



SOLUTION: On a 1st display device (display for computer or the like), gamma correction is performed with respect to an input image by a gamma- correcting means 21, and that signal is converted into a luminance signal and a color difference signal by a signal-converting means 22. The luminance signal is processed by a luminance signal correcting means 23, and the color difference signal is processed by a color difference signal correcting means 24 respectively for tone correction. Thus, the outputted luminance signal and color difference signal are encoded by an encoding means 25 and outputted as a bit stream on the decoding side, provided with the 2nd display device (TV monitor or the like). Even if the gamma characteristics of 1st and 2nd

h g e e h

display devices are different, the image (color tone) of the image quality intended by a person preparing is reproduced with fidelity on the 2nd display device.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the video-signal coding equipment which enabled it to reproduce the created high-definition video signal faithfully with video-signal decryption equipment.
[0002]
[Description of the Prior Art] In case a video signal including a still picture is encoded, the display property of the display used for the creation time of a video signal may differ from the display property of the display of the video signal after a decryption. In such a case, in order to acquire an image faithful to the image by the side of coding on the display by the side of a decryption, it is desirable to perform signal processing in consideration of the difference among those display properties.
[0003] What was conventionally indicated by JP,6-103928,B as a signal-processing technique of such a video signal is known. Below, a Prior art is explained, referring to a drawing. Drawing 3 is the block diagram showing the basic configuration of conventional video-signal coding equipment. This video-signal coding equipment consists of a peak detection means 31, a dynamic range conversion means 32, and a coding means 33.
[0004] Actuation of the video-signal coding equipment of such a configuration is explained using drawing 3 and drawing 4 . First, the video signal created using the 1st display is given as pretreatment to the peak detection means 31 of drawing 3 . The peak detection means 31 detects the maximum and the minimum value of a pixel value, and outputs them to the dynamic range conversion means 32 by making them into peak information. Based on the inputted peak information, the dynamic range conversion means 32 amends a dynamic range, and corrects the range of the level of an input signal. And with the coding means 33, a video signal is encoded and it is outputted as a bit stream. This signal is decoded with the decryption means which is not illustrated, and an image is outputted with the 2nd display.
[0005] The range of signal level is the magnitude of the range between the maximum of a signal, and the minimum value, and it is related to the contrast of an image. To the dynamic range of an indicating equipment, when the range of signal level is small, it seems to be low contrast. Moreover, when the range of signal level is large, it seems to be high contrast. As shown in drawing 4 (a), a dynamic range is created with the 1st indicating equipment of D1, and the dynamic range conversion means 32 amends a dynamic range, as the range of signal level shows drawing 4 (b) to the video signal of S1. If this video signal is inputted into the 2nd display of a dynamic range D2, an image will be displayed that a range is changed like S2 and the video signal after amendment approaches the dynamic range of the 2nd display.
[0006] By performing such amendment, it is used for the creation time of a video signal, and when inputted into the 2nd indicating equipment by the side of the decryption with the dynamic range with which the video signals distributed in the dynamic range of the 1st indicating equipment differed, the distortion on the vision of the video signal produced when not amending a dynamic range is removed. If it carries out like this, before encoding a video signal, an image can be displayed by amending the dynamic range of an input video signal, without spoiling the display capacity of a display as much as

possible.

[0007]

[Problem(s) to be Solved by the Invention] However, in such conventional video-signal coding equipment, it has the fault of the brightness and tone of an image differing from each other depending on the condition of distribution of the level of an input video signal, or changing the average level of a signal.

[0008] Moreover, in the 2nd display which displays the image after a decryption, although it is possible to suppress distortion of the image quality generated by the digital disposal circuit, there is a trouble that distortion of image quality newly occurs with the gamma property which the display tube in a display itself has.

[0009] Here, the gamma property of the display tube is briefly explained using drawing 5 . If a video signal (signal level X) as shown in CRT which is an indicating equipment at drawing 5 (a) is inputted and the multiplier of the gamma property of CRT will be set to G, the brightness Y and signal level X of an image which were displayed when the value of G was 1 are in direct proportion. It is level Y=XG as it is shown in drawing 5 (b) on the actual display tube, since the value of G exceeds 1. An image is displayed and the display level Y and the level X of an input signal stop being proportional. This is the characteristic phenomenon of CRT and the input/output relation Y=f (X) is called the gamma property. For example, the 1st display is the monitor of a personal computer or a workstation, and when the 2nd display is the display tube (CRT) of TV receiving set, gamma properties differ mutually. For this reason, only by amendment of a dynamic range, if the video signal created using the 1st display is displayed with the 2nd display, image quality will differ and will be in sight.

[0010] This invention is made in view of such a conventional trouble, and aims at offering this made video-signal coding equipment that suppresses not only the distortion of the image quality generated by the digital disposal circuit of the display which displays a video signal but the distortion of the image quality by the gamma property which the display tube itself has.

[0011]

[Means for Solving the Problem] In order to solve this technical problem invention of this application according to claim 1 It is video-signal coding equipment encoded in order to display on the 2nd display with the 2nd display property which is different from said 1st display property in the video signal created on the 1st display with the 1st display property. A gamma correction means to change an input video signal into said 2nd display property from said 1st display property, A dynamic range amendment means to amend the dynamic range of a video signal changed by said gamma correction means so that it may agree in the dynamic range of said 2nd indicating equipment, It is characterized by providing a coding means to encode the video signal outputted from said dynamic range amendment means.

[0012] Invention of this application according to claim 2 moreover, the input video signal created on the 1st display with the 1st display property A gamma correction means to be video-signal coding equipment encoded in order to display on the 2nd display with the 2nd different display property from said 1st display property, and to change an input video signal into said 2nd display property from said 1st display property, A signal transformation means to change into a luminance signal and a color-difference signal the video signal changed by said gamma correction means, A luminance-signal amendment means to amend the range of the level of the luminance signal changed with said signal transformation means, It is characterized by providing a color-difference-signal amendment means to amend the range of the level of said color-difference signal changed with said signal transformation means, and said luminance-signal amendment means and a coding means to encode the signal outputted from a color-difference-signal amendment means, respectively.

[0013] According to such a configuration, a gamma correction is first performed to an input video signal, and the display property of a display is amended. Namely, what is necessary is just to perform beforehand amendment which is equivalent to the reverse property (reverse gamma property) of a gamma property to an input signal, in order to make an output signal (how on a display to be visible) in agreement with an input signal since the input/output relation of a display is expressed with a gamma property.

[0014] After performing such a gamma correction, dynamic range amendment is carried out and coding processing is performed. In case a video signal is encoded, when the display property of the display used for the creation time of a video signal differs from the display property of the display of the video signal after a decryption by this, good image quality with little distortion can be offered on the display by the side of a decryption.

[0015]

[Embodiment of the Invention]

(Gestalt 1 of operation) The video-signal coding equipment in the gestalt of operation of the 1st of this invention is explained using a drawing. Drawing 1 is the block diagram showing the basic configuration of the video-signal coding equipment in the gestalt of this operation. This video-signal coding equipment is constituted including the gamma correction means 11, the dynamic range amendment means 12, and the coding means 13. A video signal shall be created using the 1st display. The gamma correction means 11 is a means to amend the difference in the gamma property (display property) of the 1st display and the 2nd display which displays the video signal after a decryption, when a video signal is inputted.

[0016] Gamma correction processing is explained by making into an example the case where used the display monitor for computers as the 1st indicating equipment here, and the monitor for television is used as the 2nd indicating equipment. G=1/a, and the gamma property (2nd display property) of the 2nd display are set to G=1/b, and the gamma property (1st display property) of the 1st display is set to 1>a>b>0. Then, as shown in the left-hand side of drawing 7 , it is considered by the creation time of an image that the image displayed on the 1st indicating equipment (CRT1) is the level X which the author A of an image meant. For this reason, as how on the 1st indicating equipment to be visible shows drawing 6 (a), it is natural that Author A thinks that the display level Y becomes a linear to signal level X of an image. It is the video signal Xa with which in other words Author A is set to the display level Y. It will create. Therefore, the video signal transmitted to CTR2 which Viewer B uses is Xa as shown in drawing 6 (b). It becomes. Moreover, the level Y of the image displayed on CRT1 serves as 1 (Xa) / a =X with the gamma property of CTR1.

[0017] Since the gamma properties of CRT2 of the 2nd indicating equipment are G=1/b as shown in the right-hand side of drawing 7 when such a video signal is transmitted to a decryption side, as the actual display level Y of CRT2 is shown in drawing 6 (c), they are 1 (Xa) / b =Xa/b. It becomes. With [the value of a and b / the value of coincidence **** and a/b] one [or more], as shown in drawing, the curve of an output level will curve to the up side, and will not be in agreement with the original signal. That is, Viewer B will look at the image displayed on CRT2, and will not consider that the level is X.

[0018] In view of such a situation, the gamma correction in consideration of both the gamma property which the 1st display has, and the gamma property which the 2nd display has is performed with the gamma correction means 11. First, after the gamma correction means' 11 performing the twist operations of a gamma correction by G=a and removing the gamma property of the 1st display from a video signal to an actual video signal, a gamma correction is performed by G=b. Amendment to the gamma property of the 2nd display can be performed by carrying out like this. If the above gamma correction processing is expressed with a formula, it will become like a degree type.

y=xb/a, however x are the level of the actual video signal before a gamma correction, and y is the signal level after a gamma correction.

[0019] Drawing 6 (d) is the input-output behavioral characteristics at the time of performing such a gamma correction. On the other hand, the gamma properties of CRT2 of the 2nd display of drawing 7 are G=1/b. That is, for CRT2, level like drawing 6 (e) is Xb. If a video signal is inputted, the level will be changed by G=1/b, and as shown in drawing 6 (f), it will indicate by level as Y=X. Thus, to the level X which Author A meant, amendment of G=b/a is made with the gamma correction means 11, and it is level Xb. A video signal is given to the dynamic range amendment means 12.

[0020] Next, the dynamic range amendment means 12 amends the range of the level of the video signal by which the gamma correction was carried out with the gamma correction means 11, and outputs it to the coding means 13.

[0021] At this time, like the dynamic range conversion means 32 of the conventional example shown in drawing 3 and drawing 4 , the dynamic range amendment means 12 does not bring the range S1 of the level of a video signal close to the dynamic range D2 of the 2nd indicating equipment, but the dynamic range D1 of the 1st indicating equipment shown in drawing 8 (a) amends it so that the dynamic range D2 of the 2nd indicating equipment may be approached, as shown in drawing 8 (b).

[0022] Thus, in case the video signal after a decryption is displayed on the 2nd display by amending the range of the level of a video signal, distortion of the image quality generated by the digital disposal circuit which the 2nd display has can be suppressed. Moreover, the conventional trouble of the brightness and tone of an image changing with conditions of distribution of the level of an input signal, or changing the average level of a signal is solvable.

[0023] (Gestalt 2 of operation) The video-signal coding equipment in the gestalt of operation of the 2nd of this invention is explained using a drawing. Drawing 2 is the block diagram showing the basic configuration of the video-signal coding equipment in the gestalt of this operation. This video-signal coding equipment is constituted including the gamma correction means 21, the signal transformation means 22, the luminance-signal amendment means 23, the color-difference-signal amendment means 24, and the coding means 25. A video signal shall be created using the 1st display. The gamma correction means 21 is a means to amend the difference in the gamma property of the 1st display and the 2nd display which displays the video signal after a decryption, when it is the same as that of the gestalt of the 1st operation and a video signal is inputted.

[0024] The signal transformation means 22 is a means which carries out separation conversion of the video signal by which the gamma correction was carried out with the gamma correction means 21 at a luminance signal and a color-difference signal. The luminance-signal amendment means 23 is a means to amend a dynamic range, in order to correct the range of the level of the luminance signal outputted from the signal transformation means 22. Moreover, the color-difference-signal amendment means 24 is a means to amend a dynamic range, in order to correct the range of the level of the color-difference signal outputted from the signal transformation means 22.

[0025] Here, dynamic range amendment which was suitable for each to the luminance signal and the color-difference signal is performed. For example, the case where use the display monitor for computers as the 1st indicating equipment, and the monitor for television is used as the 2nd indicating equipment like the case where the gestalt of the 1st operation shows is considered. In this case, in the monitor for television, the luminance signal and the color-difference signal are processed separately, and processing is performed so that a color-difference signal may generally be emphasized compared with a luminance signal.

[0026] In this case, the luminance-signal amendment means 23 performs dynamic range amendment shown in drawing 8 to a luminance signal like the dynamic range amendment means 12 in the gestalt of the 1st operation. On the other hand, as shown in drawing 9 (a) and (b), the color-difference-signal amendment means 24 amends level so that the dynamic range of the 1st indicating equipment may approach the dynamic range of the 2nd indicating equipment to a color-difference signal first. Next, in order to make the scale down of the level distribution of a signal carry out in the direction of a low as shown in drawing 9 (b) and (c), the multiplication of the gain K is carried out to a color-difference signal. However, it is $0< K<1$.

[0027] The coding means 25 encodes the signal outputted, respectively from the luminance-signal amendment means 23 and the color-difference-signal amendment means 24, and outputs a bit stream to a decode side.

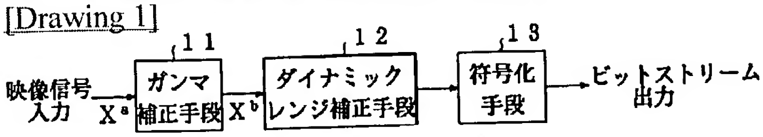
[0028] Thus, in case the picture signal after a decryption is displayed on the monitor for television by setting up the range of the level of a color-difference signal more narrowly than the range of the level of a luminance signal, the image quality which the maker of an image meant is acquired.

[0029]
[Effect of the Invention] Even when the display property of the display used for the creation time of a video signal in coding of a video signal differs from the display property of the display of the video signal after a decryption as mentioned above according to this invention, the video signal displayed on a

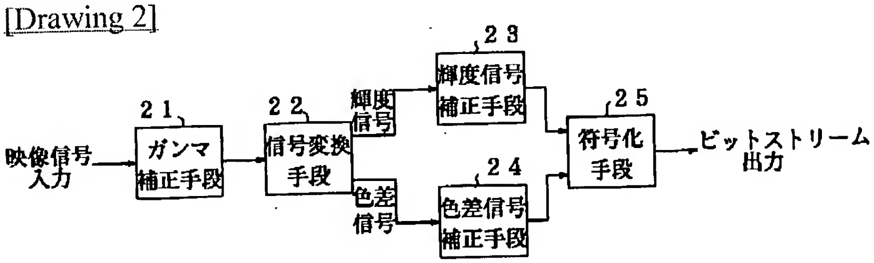
display after a decryption can suppress not only distortion generated by the digital disposal circuit of a display but the distortion by the gamma property which the display tube itself has. For this reason, the image quality which the author of an image meant is faithfully reproducible by the decode equipment side.

[Translation done.]

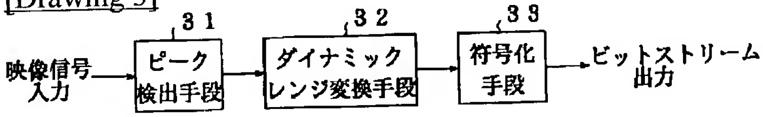
[Drawing 1]


1 1
1 2
1 3
映像信号入力
Xᵃ
ガンマ補正手段
Xᵇ
ダイナミックレンジ補正手段
符号化手段
ビットストリーム出力

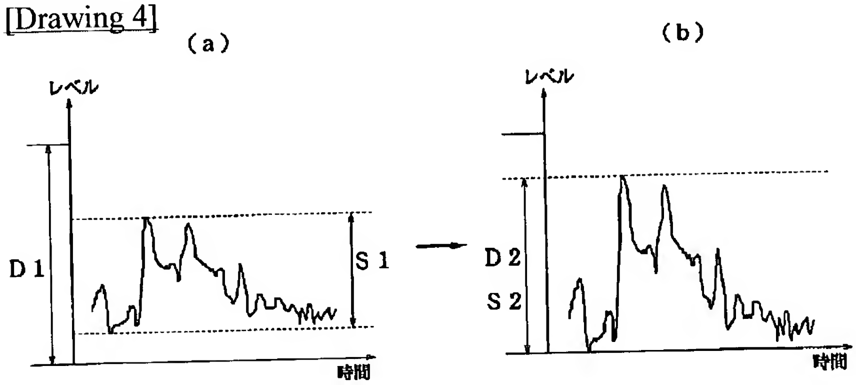
[Drawing 2]


2 3
2 1
2 2
輝度信号
輝度信号補正手段
2 5
映像信号入力
ガンマ補正手段
信号変換手段
符号化手段
ビットストリーム出力
2 4
色差信号
色差信号補正手段

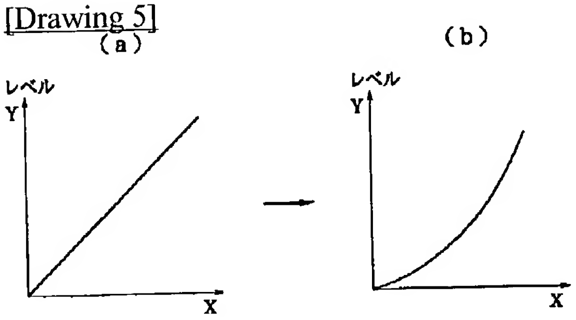
[Drawing 3]


3 1
3 2
3 3
映像信号入力
ピーク検出手段
ダイナミックレンジ変換手段
符号化手段
ビットストリーム出力

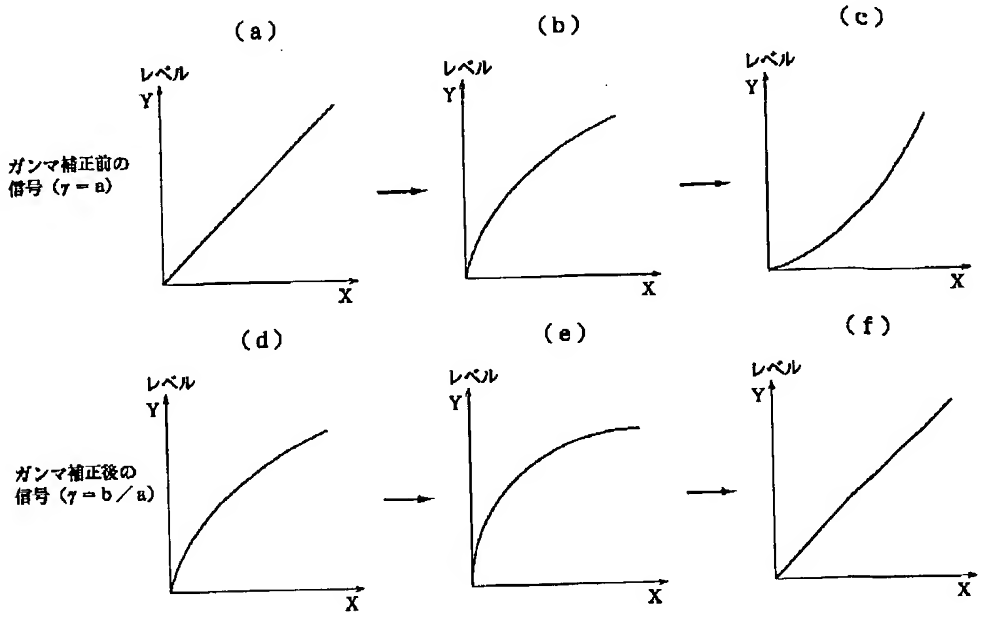
[Drawing 4]



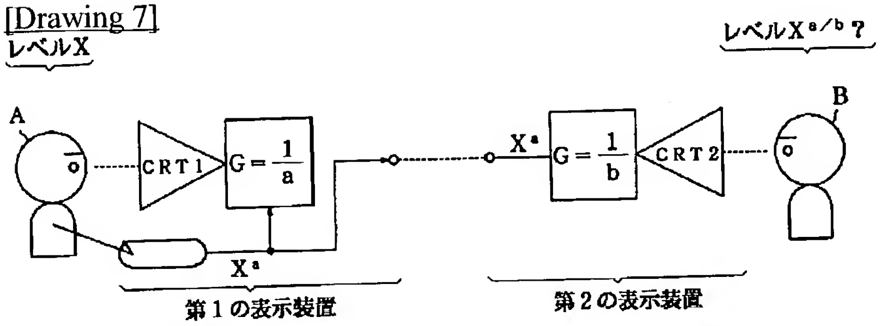
[Drawing 5]



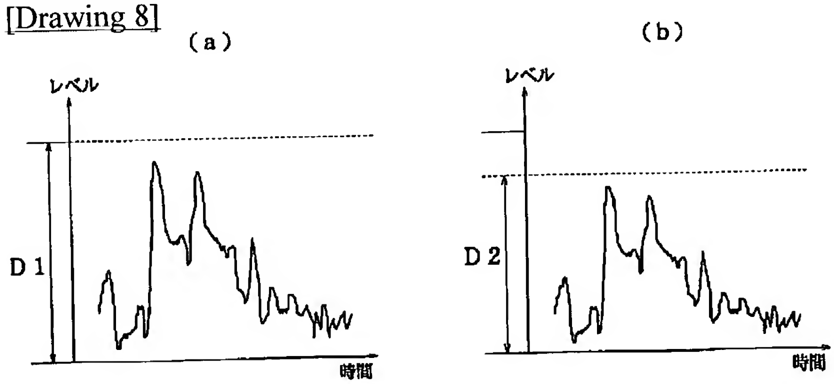
[Drawing 6]



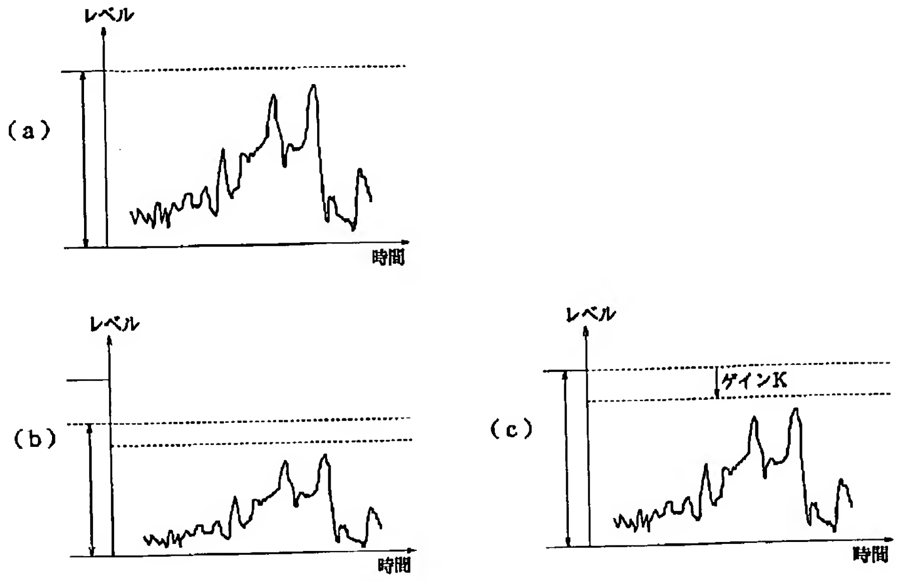
[Drawing 7]


レベルX
レベルX^{a/b}?
A
B
CRT1
G＝1/a
X^a
X^a
G＝1/b
CRT2
第１の表示装置
第２の表示装置

[Drawing 8]



[Drawing 9]



[Translation done.]